Learning the Theory **Bus**

Traffic, Technology, Passenger and Transport Legislation Basic Knowledge

1

MANUAL

BUS

CODE 95

PROFESSIONAL DRIVER

ACCORDING TO NATIONAL AND EUROPEAN REQUIREMENTS FOR THE DRIVING LICENCE AND PROFESSIONAL COMPETENCE

VTO

VERVOER & LOGISTIEK

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CHAPTER 1

Traffic

Traffic is the movement of people, animals or goods using the public road by using, for example, a car, lorry, bus or bicycle. Or simply by walking.

Safety, flow and protection of the environment have the highest priorities in traffic. To guarantee this, acts and rules have been created that all those who participate in traffic must comply with.

Test terms 1.1 and 1.3.

1.1 Terms from the WVW and the RVV D1&D

The Wegenverkeerswet 1994 (WVW; Dutch Road Traffic Act 1994) describes the general guidelines for safe road use, that is: the foundations. The details are contained in various Regulations and Schemes. A very important one is the Reglement verkeersregels en verkeerstekens 1990 (RVV; Dutch Road Traffic Signs and Regulations 1990). Many of the topics in this first section come from the RVV.

Acts and rules help in ensuring traffic is safer.

Many terms are contained in the WVW and the RVV. You must know them (and know what they mean) to participate in traffic safely.

You will probably know many of these terms, but we have listed the most important ones for you again in **Annex 1** at the back of this book. We recommend you check them out before you continue reading this book.

We will briefly discuss two subjects here:

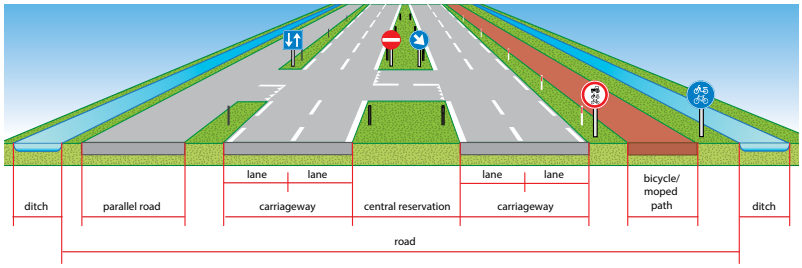
Road users and drivers/riders
Some rules apply to all road users while others only to drivers/riders. But what is that? In short:

- a road user is anybody who participates in traffic. Instead of road users, the term 'traffic participants' is used and sometimes even 'traffic',
- drivers/riders are all road users except pedestrians.

A distinction is often made between 'road users' and 'drivers' in legislation and regulations. You must therefore know what the difference is.

Road, carriageway and lane
Some rules apply to the entire width of the road while others only to the carriageway or a lane. But what are they? In brief:

- roads are all paved and unpaved roads, bridges, viaducts and tunnels including footpaths, cycle paths, shoulders or sides,
- the carriageway is the section of the road that is intended for driving and riding vehicles except the cycle paths and the bicycle/moped paths,
- a lane is a section of the carriageway that is marked by solid or broken lines and that has such a width that vehicles with an engine or motor with more than two wheels can use it.



Test term 1.2.

1.2 The WVW D1&D

The rules set out in the Dutch Road Traffic Act 1994 are intended for the following:

- safeguard the safety of traffic,
- safeguard the flow of traffic,
- prevent damage to roads or the environment,
- prevent fraud when participating in traffic,
- arrange the competences of regulators.

Important articles from the WVW include (freely translated):

Article 5
It is an offence for any road user to act in such a manner as to cause a hazard (or a potential hazard) on the public highway or to obstruct other road users in any way.

This also applies to people who do not participate in traffic. If, for example, you are standing next to the road with an open boot and a suitcase falls out close to a cyclist on the road, Article 5 also applies.

All behaviour that does not fall under another Article, falls under Article 5. This is therefore also referred to as the 'flexible clause'.

Article 5a
Nobody may breach traffic rules on purpose in such a way that a risk of serious accidents occurs. This, for example, refers to: overtaking dangerously, ignoring a red cross, driving on the hard shoulder when this is not allowed, driving or riding too fast, driving or riding too close to the person in front and driving or riding against traffic.

Article 6
All participants in traffic are forbidden to behave in such a way that they might cause a traffic accident to occur in which another person is killed or sustains serious physical injury.

Article 7
It is an offence for any person involved in a road accident of any kind to leave the scene of the accident if:

- there have been people who are physically injured or fatalities,
- damage has been caused to the other party.

You are only permitted to leave the scene of an accident when you have made known your identity and the data of your vehicle.

If you flee the location of an accident, but hand yourself in within 12 hours, you may prevent being prosecuted based on Article 7.

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CHAPTER 2

Technical aspects

Test terms 2.3, 2.4 and 2.5.

2.1 The construction and operation of engines and motors

2.1.1 The combustion engine

In a combustion engine, a mixture of air and fuel are combusted, which releases energy. The following can be used as fuel:

- traditional diesel produced from crude oil,
- biodiesel produced from vegetable products,
- a combination of traditional diesel and biodiesel,
- liquid natural gas (LNG) or biogas (bio-LNG),
- compressed natural gas (CNG) or biogas (bio-CNG),
- hydrogen gas (H_2).

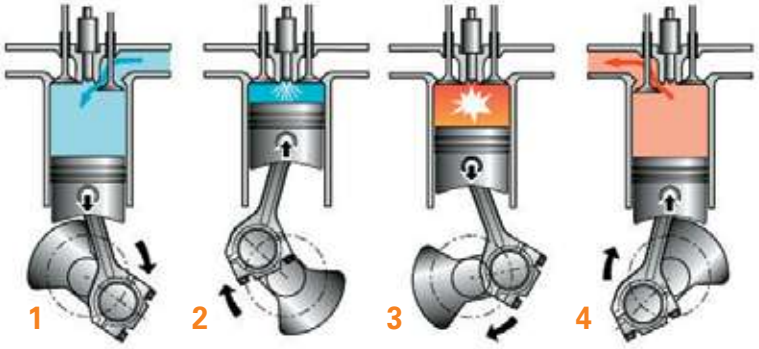
Pistons and cylinders

A combustion engine has cylinders. Usually there are 4 or 6. Pistons go up and down in those cylinders, which means that the crankshaft starts to turn. This turning movement is passed onto the driven wheels of the vehicle through the drive line.

Six pistons (of a 6 cylinder in-linder engine) that are each connected to the crankshaft through a connecting rod ('conrod').

Diesel engine combustion process

The combustion process of a diesel engine includes four strokes: 1. air flows into the cylinder. 2. this air is compressed together (and therefore seriously heated). If the piston is at the top, diesel is injected. 3. this diesel combusts (naturally due to the high temperature) and the piston is pushed down with force. 4. the exhaust gases are discharged.



1. *Intake stroke*
2. *Compression stroke*
3. *Ignition stroke*
4. *Exhaust stroke*

LNG/CNG/hydrogen engine combustion process

A combustion engine that runs on LNG, CNG or hydrogen can be built in various ways. If we oversimplify this, there are two options:

- a diesel engine is used as the foundation. Air is taken to the cylinder during the intake stroke. At the end of the compression stroke, the gas plus a very small amount of diesel* is injected into the cylinder after which the mixture (self-)combusts,
- a petrol engine forms the basis. Air and gas flows into the cylinder during the intake stroke. At the end of the compression stroke, the mixture is ignited with a spark plug**.

* *The temperature in the cylinder is never sufficiently high to have the gas combust, but it is sufficiently high to have the diesel combust. This means that the gas also combusts.*

** *The temperature in the cylinder is never sufficiently high to have the gas combust. For this reason, there is a spark plug at the top of the cylinder that emits a spark at the end of the compression stroke to have the mixture of gas and air combust.*

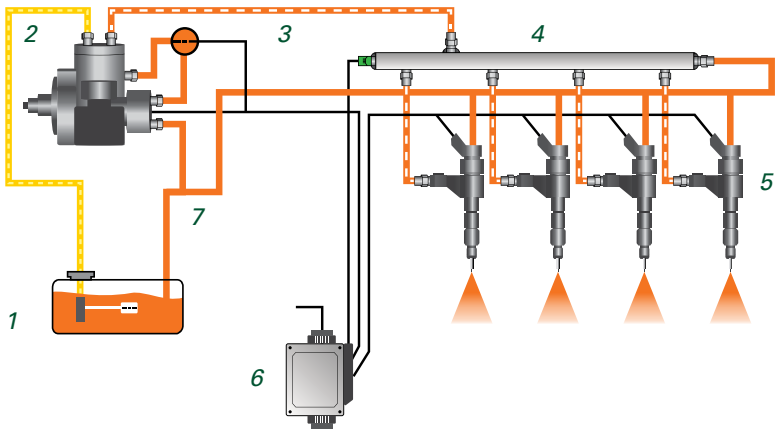
Technical operation
In this chapter for convenience we cover LNG, CNG and hydrogen combustion engines as one. This is possible because in general the technical operation of these engines is the same.

You can find more information on these drive technologies, that are also partly still being developed in **annex 6**.

Exhaust system
The exhaust gases from an internal combustion engine are filtered and cleaned in the exhaust system. Later in this textbook and in module 2, we will discuss this in more detail.

The fuel system of a combustion engine
The function of the fuel system is not surprising: it ensures that the engine is fed with fuel.

Diesel engine
With a diesel engine the system looks like this:



Schematic image of a common rail fuel system in a diesel engine.

- from the tank (1), diesel is pumped through several filters to the high-pressure pump (2). The fuel is fed at high pressure (> 2,000 bar) through the high-pressure line (3) the common rail (4), where it is temporarily 'stored' until it is injected into the cylinders by the atomisers (5),

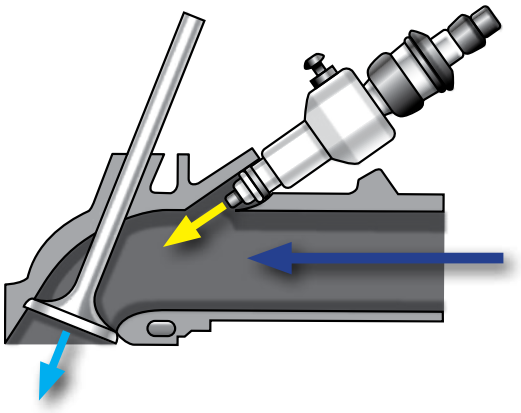
- the electronic control unit (6) controls the entire system,
- excess fuel flows back to the fuel tank through the return line (7).

LNG, CNG and H_2 engine based on the diesel engine
With this engine type, a 2nd fuel system is needed to bring the gas from the LNG, CNG, or hydrogen tank to the engine through various components*.

The electronic control module then determines when and how much gas (along with a small amount of diesel) is injected into each cylinder. Special atomisers are used which can inject gas and diesel at the same time.

LNG, CNG and H_2 engine based on a petrol engine
Only gas is burned in these engines. So only one fuel system is also needed, ensuring that the gas arrives at the engine at the right pressure and temperature.

There it is injected into the intake air ducts by injectors. Together with the intake air it flows into the cylinders, is compressed by the pistons and ignite by sparkplugs.



The gas (yellow arrow) is injected in the intake duct of the cylinder and will thereafter flow together with the intake air (navy blue arrow) into the cylinder through the intake valve (light blue arrow).

Air filter
The air needed in the engine for combustion is simply drawn from the outside air. This is done through the air intake, which is mounted a little higher to suck in the cleanest air possible.

* *These components ensure that the gas gets to the right temperature and the right constant pressure.*

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CHAPTER 3

Passenger travel

Test term 3.1.

3.1 Safety and comfort D1&D

As the driver, you are responsible for your passengers arriving at their destination safely and comfortably.

Route preparation

Ensure you are well-prepared before setting out. Important parts of this include:

- ensure you are 'fresh' when you get behind the wheel. Ensure you are rested and not under the influence (anymore) of, for example, alcohol,
- be absolutely sure that the vehicle is in good technical order and ready for use. Sometimes the workshop will perform this check*, but in other cases you will have to do them yourself,
- ensure you know which route(s) you must drive, at which place or places you must stop and what your arrival and departure times are,
- ensure all mandatory and required documents are 'on-board' so that you can consult them when on the road or hand them over when there is a traffic stop. We discuss this further in section 4.

Depending on the transport type, your bus will be equipped with various passenger facilities:

- safety devices such as seat belts, emergency exits (doors, hatches and windows), fire extinguishers and first-aid kits. It should be obvious that they must be in good order,

* *You must, in that case, know for sure that this check has actually been performed before you start driving.*

- comfort facilities such as air-conditioning, wi-fi, a toilet and a minibar. Passengers count on them and will be dissatisfied if they cannot use them.

Comfort facilities that do not work lead to inconvenience and irritation, especially so during longer journeys.

Safety rules
Ensure your passengers know which safety rules apply:

- within the private bus transport (coach transport) sector*, you must inform your passengers before leaving concerning, for example, having to use a seat belt, putting hand luggage away and the rules for standing/walking while the bus is moving,
- you do not repeatedly need to give instructions for public transport. Do, however, keep an eye out to determine whether your passengers are behaving safely and intervene when required.

Multitasking?
The safety and comfort of your passengers must always have the highest priority. Other responsibilities may never be at the expense of this. For example:

* *You can read what is exactly meant with the terms 'private bus transport' and 'public (bus) transport' in section 4.*

- if it is busy on the road and, as a result, you cannot keep to the timetable for public transport, you must still wait calmly at each stop for all passengers to safely take a seat/place before you set off again,
- if a coach passenger comes to you to complain about a coffee machine that does not work while you need all your attention on the traffic on the road, you must indicate in a friendly manner that you do not have time at the moment to discuss this.

If a situation, event or passenger requires urgent attention, first stop at a safe location.

Wait until all passengers have safely taken a seat before setting off from a bus stop.

Test term 3.2.

3.2 Interaction with passengers D1&D

Passengers of a bus or coach are very different: young and old, happy and bad-tempered, cooperative and rebellious, etc. You will, as the driver, have to select a good way to interact with each of these passenger types.

Drivers of a coach often know in advance which passenger types they will be transporting and can, therefore, prepare themselves properly.

Drivers of public bus transport will only see which type they have when they board the bus and must, therefore, decide on the spot what the correct form for interaction is.

Passenger characteristics

Although you can never know with 100% certainty what the best way in which to interact with a specific passenger is, you can be aware of the particular characteristics of specific groups. For example:

- older passengers often see and hear less well, are slower and less stable. Speak extra clearly, check to see if they understand you, see if they need help and be patient,
- students can be elated and impulsive and will take little account of other passengers. They will often also be involved with each other or their phones; to establish contact with them may be difficult. Be understanding, but do call them to account if their behaviour causes too much inconvenience,
- passengers who are coming back from a night on the town, concert or football match have often been drinking or used drugs. They can be loud or defiant and may have a short fuse.

Do not allow minor annoyances to get to you, but be clear regarding which behaviour you will not tolerate.

Target group transport

For some passenger types, the authorities organise and pay for the transport. This mainly concerns passengers with an impairment and students in the special education system.

There are many different restriction types. Some passengers move with difficulty, or are in a wheelchair, and others may be less capable of hearing or seeing, or respond less quickly. Assess the situation correctly and decide what you need to do. Offer help when needed, but do not exaggerate. Most passengers with an impairment want to be treated the same as other passengers as much as possible.

Special education is for students with a physical, sensory or mental impairment and for students who have psychological or behavioural issues. Regarding these passengers, you must also carefully asses what you may expect and how you need to deal with that.

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CHAPTER 4

Legislation and regulations

Test term 4.1.

4.1 Legislation and regulations for drivers D1&D

Arbeidstijdenwet (ATW; Working Hours Act)
To ensure that the health, safety and wellbeing of employees are not put at risk, rules have been set down regarding working hours.

These rules determine, for example, how long someone may work consecutively, how often someone may work at night and how many free Sundays someone must have.

Arbeidstijdenbesluit vervoer (Atb-v; Working Hours Decree for Transport)
Extra rules apply to drivers and co-drivers of buses (who drive on the public road). They are described in the Atb-v*.

The tachograph and driver's card
Most buses have a mandatory integrated tachograph.

Drivers must have a personal driver's card that must be inserted in the tachograph during the working day.

The working hours, driving times and resting periods of the driver, along with other data, is registered on the driver's card (and also on the internal memory of the tachograph).

* *The Dutch Atb-v is based on EU Regulation 561/2006 that regulates the driving times and rest periods within the EU (and a few other countries).*

The tachograph registers your driving times and rest periods.

A driver's card can be applied for from the KIWA Register.

The driver's card is personal. You may only drive using your own card.

Your driver's card is valid for a limited period. You must renew it on time. You may not drive with an expired card.

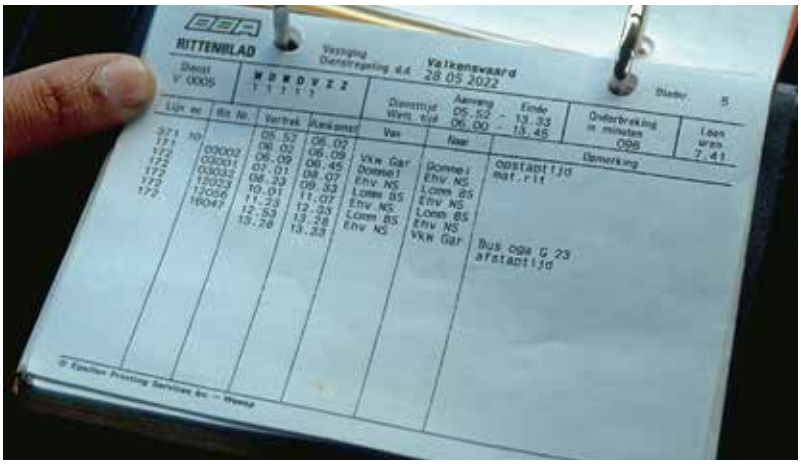
Driving with a faulty card is also prohibited, but, if you have applied for a replacement card, you may temporarily drive without a card. At the beginning and end of each day, you must then create a printout and manually keep track of your working hours, driving times and rest periods.

Timetable instead of a tachograph
A tachograph is not necessary in the vehicle and the driver does not need to use a driver's card in national public bus transport on journeys of up to 50 kilometres*.

Instead, the operator needs to draw up a timetable that the driver must have with him/her during the journey (to show during any possible check/stop).

* *Somewhat different rules apply for international public transport, but we will not discuss these here.*

On public transport journeys of up to 50 km, a timetable may be used instead of a tachograph.



Exemptions

In vehicles that are used for driving lessons and tests, a tachograph or timetable is not required.

Some transport types are also exempted, but this only concerns 'goods transport' (see **Annex 8**).

Code 95

Drivers who professionally drive a bus must be 'competent'. They can prove this by a code on their driving licence: code 95.

To get code 95, they must sit a number of theory tests and mock practical tests/practical tests. To retain code 95, they must regularly retrain (at least 35 hours every 5 years).

Those who drive a bus as a hobby, do not need to have code 95. Some professional drivers are also exempted (see **Annex 8**).

Code 95 is specified on the back of the driving licence.

4.2 Driving times and rest periods D1&D

Test term 4.2.

The rules regarding driving times and rest periods (from the Atb-v) apply to* drivers and co-drivers of:

- lorries with a load capacity > 500 kilograms,
- individual tractors,
- buses and (partial) taxis.

Terms

Below we briefly discuss a number of terms and provisions. They are discussed more extensively in the M3D textbook, along with all other terms and provisions.

- driving time is the time that a vehicle is driven including waiting at, for example, traffic lights and in queues**,
- the daily driving time is the sum total driving time during a working day**,
- a break is a period when the driver may not drive and may not perform any other tasks either**.

Provisions

The daily driving time may be at most 9 hours as standard. This may be extended twice a week up to a maximum of 10 hours.

However, you may not drive those 9 or 10 hours consecutively; you must take regular breaks.

The standard rule is that you may drive at most 4.5 consecutive hours and must then have a break of at least 45 minutes.

* *Except when they fall under an exemption as described in Annex 8.*
** *These are simplified views of articles 4j, 4k and 4d of EU Regulation 561/2006.*

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CHAPTER 5

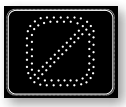
Traffic signs and signals

A Speed

A1
Speed limit.

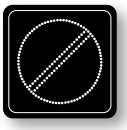
A2
End of speed limit.

A3
Speed limit displayed on a display panel.



End of all prohibitions imposed by electronic warning signs.

Maximum speed 80 km/h on electronic sign.



End of all prohibitions imposed by electronic warning signs.

Start sign: the black background indicates the start of a new speed limit.

A4
Recommended speed.

A5
End of recommended speed.

B Priority

B1
Priority road.

B2
End of priority road.

B3
Priority junction.

B4
Road junction with priority over minor road from the left.

B5
Road junction with priority over minor road from the right.

B6
Give priority to drivers on the main road ahead.

B7
Stop; give priority to drivers on the main road ahead

C Road closed sign

C1
Road closed in both directions for vehicles, horse riders and people in charge of draught animals or cattle.

C2
No entry in this direction for vehicular traffic, horse riders and people in charge of draught animals or cattle.

C3
One-way road.

C4
One-way road.

C5
Access permitted.

C6
No access for vehicles with more than two wheels.

C7
No access for lorries vehicles.

C7a
No acces for buses.

C7b
No acces for buses and lorries.

C8
No access for agricultural and forestry tractors, motor vehicles with limited speed or mobile machines.

C9
No access for horse riders, cattle, carriages, agricultural and forestry tractors, motor vehicles with limited speed, mobile machines, microcars, bicycles, mopeds or vehicles adapted for disabled drivers.

C10
No access for motor vehicles towing trailers.

C11
No access for motorcyclists.

C12
No access for motor vehicles.

C13
No access for mopeds, motor-assisted bicycles or motor-powered vehicles adapted for disabled drivers, with engine running.

C14
Closed to bicycles and non-motorized vehicles for the disabled.

C15
No access for bicycles, motor-assisted bicycles, mopeds and vehicles for disabled people.

C16
No access for pedestrians.

C17
No access for vehicles and combinations of vehicles with a length, including the load, greater than indicated.

C18
No access for vehicles with a width, including the load, greater than indicated.

C19
No access for vehicles with a height, including the load, greater than indicated.

C20
No access for vehicles with an axle load greater than indicated.

C21
No access for vehicles or combinations of vehicles with a total weight or the sum of axle loads greater than indicated.

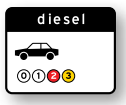
C22
No access for vehicles carrying hazardous substances.

C22e
Closed to passenger cars, commercial vehicles, lorries and buses or taxis due to emission requirements (low-emission zone or zero-emission zone).

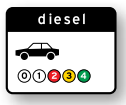
C22f
End of road closed due to emission requirements (low-emission zone or zero-emission zone).

C22e1
Supplementary sign to C22e: zero-emission zone accessible to commercial vehicles and lorries that qualify as zero-emission vehicles.

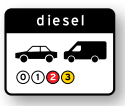
C22e2
Supplementary sign to C22e: zero-emission zone accessible to commercial vehicles, lorries and taxis that qualify as zero-emission vehicles.



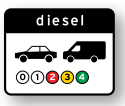
C22e4
Supplementary sign to C22e: low-emission zone accessible to diesel passenger cars that fall in emission classes 4 to 6.



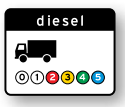
C22e5
Supplementary sign to C22e: low-emission zone accessible to diesel passenger cars that fall in emission classes 5 and 6.



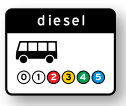
C22e6
Supplementary sign to C22e: low-emission zone accessible to diesel passenger cars and commercial vehicles that fall in emission classes 4 to 6.



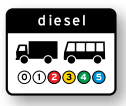
C22e7
Supplementary sign to C22e: low-emission zone accessible to diesel passenger cars and commercial vehicles that fall in emission classes 5 and 6.



C22e8
Supplementary sign to sign C22e: low-emission zone accessible to lorries that fall in emission class 6.



C22e9
Supplementary sign to C22e: low-emission zone accessible to buses that fall in emission class 6.



C22e10
Supplementary sign to sign C22e: low-emission zone accessible to lorries and buses that fall in emission class 6.

C23-01
Rush-hour lane open.

C23-02
Leave rush-hour lane.

C23-03
End of rush-hour lane.

D Driving direction

D1
Roundabout; compulsory driving direction.

D2
Instruction to all drivers to keep to the right of the sign (or left if arrow is reversed).

D3
This sign may be passed on either side.

D4
Instruction to follow the indicated driving direction.

D5
Instruction to follow the indicated driving direction.

D6
Instruction to follow one of the directions ahead shown by the arrows.

D7
Instruction to follow one of the directions ahead shown by the arrows.

E Parking and stopping

E1
No parking.

E2
No stopping.

E3
No parking bicycles and mopeds.

E4
Parking.

E5
Taxi rank.

E6
Parking for disabled drivers.

E7
Parking permitted for the immediate loading and unloading of goods only.

E8
Parking facilities only for vehicle category shown.

E8a
Parking for lorries and buses.

E8b
Parking space only for parking with two wheels on the pavement.

E8c
Parking space only for charging electric vehicles.

E8g
Space intended for parking bicycles and mopeds only.

E8m
Parking space reserved for motorcycles only.

E8n
Parking space reserved for camper vans only.

E9
Parking for licence holders only.

VEKABEST

SAMPLE EXCERPT

the rest of this chapter
is not available in the sample excerpt